NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

SHALLOW WATER DEVELOPMENT AND MANAGEMENT

(Acre)

CODE 646

DEFINITION

The inundation of lands to provide habitat for fish and/or wildlife.

PURPOSE

- To provide open water areas on agricultural fields and moist soil areas (manmade impoundments managed for native herbaceous vegetation) to facilitate waterfowl resting and feeding.

- To provide habitat for wildlife such as shorebirds, wading birds, mammals, fish, reptiles, amphibians, and other species that require shallow water for at least a part of their life cycle.

- To enhance off-site water quality for the benefit of downstream aquatic wildlife.

CONDITIONS WHERE PRACTICE APPLIES

On agricultural and moist soil areas where water can be impounded or regulated by dikes, ditches, excavation, or flooding. For the purpose of this standard, agricultural fields are croplands, and moist soil areas are grassy/weedy areas of native herbaceous vegetation. Optimum sites would typically occur on 2 percent or less slopes where the majority of the area develops acceptable water depths within reasonable economic constraints.

On floodplain areas that provide refuge habitats for native fish during high flow periods (larger primary floodplains with long duration spring flooding).

This practice can be used to facilitate the conservation of declining wetland dependent and threatened and endangered species.

This practice does not apply to Wetland Restoration (657) intended to rehabilitate a degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned to original conditions; Wetland Enhancement (659) intended to rehabilitate a degraded wetland where specific functions and/or values are enhanced beyond original conditions; or Wetland Creation (658) for creating a wetland on a site location that historically was not a wetland or on a site that was formerly a wetland, but will be replaced with a wetland type not naturally occurring on the site.

CRITERIA

General Criteria Applicable to all Purposes

- Soils should have low permeability (less than 0.6 inches per hour) or seasonal high water table to inhibit subsurface drainage and allow for maintenance of proper water levels.

- Site must be free of hazardous materials.

- Shallow water impoundments require an adequate water supply for reflooding. Potential water supplies include floodwaters, upland runoff, or a pumped source.

  A water control structure for removing water is required when artificial dewatering is planned. Water control structures are not required for natural drawdown (e.g., excavated areas planned for drawdown through evaporation).

- Harmful pests present on the site will be controlled or eliminated, as necessary, to achieve and maintain the intended purpose. No plant listed as "rank 1" by the Tennessee Exotic Pest Plant Council shall be established on the site.

- Where active habitat management is planned such as disking or water level management, a point of access will be planned and developed.

- Structures installed to develop and maintain shallow water areas shall be designed and installed to meet NRCS standards for the particular structure and type of construction.

- Landowner shall obtain all necessary local, state, and federal permits. Required permits for construction activities may include U.S. Army Corps of Engineers 404 permit, Tennessee Department of Environment and Conservation ARAP permit, and/or Tennessee Valley Authority 26A permit.

- If pumping, water rights must be assured.

- The standards and specifications for Dike (356), Pumping Plant for Water Control (533), and Structure for Water Control (587) will be used, as appropriate. Refer to Chapter 6 of the National Engineering Handbook, "Structures," for additional design information. Existing drainage systems will be utilized, removed, or modified as needed to achieve the intended purpose.

- During periods of planned inundation, water levels shall be maintained at an average depth of from 1 to 18 inches over at least 50 percent of the area subject to available and adequate water supplies.

Criteria Applicable to Agricultural Fields and Moist Soil Areas Planned for Waterfowl

- An adequate method of dewatering is required when water levels must be artificially lowered to produce desired habitat condition.

- Areas planned to provide waterfowl feeding and resting habitat shall be designed to facilitate gradual flooding

of areas containing food plants to an average depth of 6 to 10 inches.

- Areas containing food plants shall be flooded during seasonal periods of waterfowl use.

Criteria to Provide Habitat for Shorebirds

- During seasonal periods of shorebird use, areas planned to provide shorebird habitat shall have exposed mudflats and areas with one to four inches of water.

Criteria to Provide Habitat for Amphibians

- Inundation shall be planned to last throughout the local breeding period of at least one endemic amphibian species.

- Surrounding upland habitat shall be of sufficient quality and quantity to support the complete lifecycle requirements of at least one endemic amphibian species.

- Structures shall be designed to prevent fish access to areas planned for amphibian breeding habitat.

Criteria for Off-Stream Stream Fish Habitat

- Water control structures shall be designed to prevent native fish from being trapped as water recedes from the site.

Criteria Applicable to Provide Off-site Water Quality Benefits

- Shallow water areas subject to adjacent areas contributing excessive sediment, nutrients, animal wastes, or other potential contaminants shall have a minimum 20-foot buffer of native vegetation or introduced vegetation beneficial to wildlife established and maintained at densities adequate to provide the necessary filtering. Refer to the standard for Filter Strip (393) for possible mixtures and recommended seeding rates.

- Shallow water areas within cropland fields or receiving direct runoff from cropland shall be dewatered slowly to retain trapped sediments and facilitate nutrient and pesticide removal.

CONSIDERATIONS

ALL AREAS

When multiple areas are available, adopt a variety of flood-up and drawdown strategies for maximum habitat diversity.

Nearly level sites will allow for larger units while keeping planned water depths within the optimum range over most of the unit.

Where impoundments are developed, shorelines with irregular shapes and varying side slopes from 9:1 to 20:1 along water surface margins may increase habitat diversity.

Consider movement of dissolved and suspended substances to downstream surface and ground water.

The practice may affect downstream flows or aquifers that would affect other water used or users.

Consider disease vectors such as mosquitoes.

The composition and extent of surrounding upland vegetation may influence this practice's habitat functions.

The practice may raise downstream water temperature, causing detrimental impacts to associated aquatic and terrestrial communities.

Soil disturbance may increase the probability of invasion by unwanted plant species.

Consider effects on wetlands or wildlife habitats that would be associated with the practice. Consider conducting an assessment such as a 'scope and effect' to avoid any potential adverse impact to adjacent wetlands. Avoid constructing large levees that would either prevent the recharge of or permanently inundate adjacent wetlands.

Consider the potential movement of dissolved substances (i.e., nutrients, chemicals) and bacteria from waterfowl wastes to ground water and to downstream surface waters.

Levee construction in floodplains may eliminate flood storage and increase flooding on adjacent lands. Compensate by downsizing levee heights and locating levees higher in the floodplain. Refer to Executive Order 11888 and Section 190 of the General Manual on floodplain management for all new levee construction in floodplains.

Buffers should consist of plant communities beneficial to wildlife and/or capable of removing potential contaminants. Plan practices such as Filter Strip (393) and/or Field Border (386) to establish a suitable buffer from the adjacent land use. Where practical and desired, widen the buffer to meet the habitat needs of targeted terrestrial wildlife species.

Buffers associated with pool areas considered adequate for breeding amphibians should have a width of at least 500 feet, and when possible, maintain connection (unbroken terrestrial habitat) with nearby streams and forests. Amphibian breeding ponds are shallow areas above seasonal floodplains consistently holding water from winter to mid-summer and dried completely by fall in most years to remain fish free.

When manipulating vegetation on areas scheduled for sport hunting, consider applicable baiting laws.

Limit human disturbance during peak waterfowl and shorebird use. On larger areas where sport hunting is planned, consider setting aside from hunting a designated sanctuary. Avoid hunting after noon or limit hunting to no more than two days per week.

AGRICULTURAL FIELDS

When flooding crop residues and waste grain where water supplies are readily available, consider flooding in periodic increments (preferably 4-6 inches) to extend the availability of food.

Consider the deterioration rates of seed or waste grain after flooding (**Table 1**). Grains with higher deterioration rates

should be flooded more gradually to extend food value.

TABLE 1.

APPROXIMATE DETERIORATION RATES OF SELECT SEEDS AFTER 90 DAYS OF FLOODING	
Soybean	86 percent
Barnyardgrass (Wild Millet)	57 percent
Corn	50 percent
Buckwheat	45 percent
Grain Sorghum	42 percent
Pennsylvania smartweed	21 percent
Cultivated Rice	19 percent
Water Oak Acorns	4 percent
Horned Beakrush	2 percent

Consider crop treatments that enhance food availability. General recommendations are:

1. Millets – Leave unharvested and flood gradually. Millets best suited to flooding in order of preference are (1) Japanese millet (*Echinocloa crusgalli* var. *frumentacea*); (2) White Proso millet (*Panicum miliaceum*); (3) German millet (*Setaria italica*); and (4) browntop millet (*Panicum ramosum*).

2. Rice – Do not disk harvested fields before flooding.

3. Soybeans – Avoid flooding fields. Soybeans decompose rapidly and can plug digestive tracts of waterfowl.

4. Corn, Milo – Corn and milo should be flooded in November for optimum waterfowl benefits.

For shorebirds, consider drawing water down from flooded fields at the rate of 1-2 inches per week beginning in March to benefit early migrants. For wildlife in general, dewater in 6-inch increments, holding water for several weeks between the dewatering phases to concentrate aquatic insect food sources. Adjust the rate of drawdown based on the type and planting date of the next scheduled crop.

MOIST SOIL AREAS

Flood-up

To ensure foods are available over a longer period of time for dabbling ducks and other species, impoundments should be flooded gradually. Consider gradually flooding in response to desired plant growth. Do not begin flooding before the desired plants reach a height of at least 6 inches. Raise water levels slowly, maintaining about one-third the height of the plants until the desired depth is reached.

Fall flooding may also be timed to the arrival of early migratory species. For early migratory waterfowl, begin flooding in mid-August and shallowly flood about 10 percent of the area. After October 1, begin increasing water levels in 6-inch increments, until the entire area is flooded by December 15. For fall migrating shorebirds, the critical period for having areas flooded in the Mississippi Alluvial Valley is from July 15 to September 30.

Consider the species flooding tolerances and composition of seed in the soil at the site. Millets, grasses, and smartweeds should not be completely submerged for more than three days during establishment (growth phase).

For shorebird habitat, consider disking, mowing, or grazing areas (especially shallower parts of the area, where full

floodwater depths would range from 4-12 inches or undesirable vegetation exists) in late summer before flood-up. This will increase detritus (decaying organic matter) levels for aquatic insects and may create open water areas in dense stands of emergent vegetation.

Drawdown

Consider the type of drawdown on plant species composition. Rapid draw downs (generally four days or less) encourage extensive stands of fewer plant species and more perennials. Slower draw downs (generally two weeks or longer) encourage greater diversity of plants and hold wildlife longer.

Consider the effects of the timing of the drawdown. Early spring draw downs may be timed to shorebird migration (April to May) or scheduled for manipulation of the plant composition of the site. Early season draw downs typically result in higher seed production, while mid- to late-season draw downs typically result in a better variety of preferred plants. For this reason, when multiple areas are available, adopt a variety of drawdown strategies for maximum habitat diversity. **Table 2** provides a general guide of native plant responses to different drawdown dates.

TABLE 2.
COMMON MOIST SOIL PLANTS EXPECTED TO BE FAVORED BY DRAWDOWN PERIODS UNDER NORMAL GROWING SEASON MOISTURE CONDITIONS

EARLY SEASON
(Drawdown Completed Within First 45 Days of the Growing Season):

Barnyardgrass	Yellow Nutsedge
Smartweed	Asters

MID-SEASON
(Drawdown after First 45 Days of Growing Season and Before July 1):

Crabgrass	Panic Grasses
Walter Millet	Curly Dock
Cocklebur	Beggarticks

LATE SEASON
(Drawdown Completed after July 1):

Sprangletop	Crabgrass
Beggarticks	

Maintain some semi-permanent and permanent shallow water on the site for several years to develop submergent vegetation and associated aquatic insects. Allowing some of the deeper pools to develop scrub shrub plant communities will increase vertebrate abundance. Where drawdown capabilities exist for these deep pools, consider a drawdown once every three-ten years, increasing the time between draw downs for larger systems. This will reduce organic matter (muck) buildup and remove fish that would predate on amphibians.

PLANS AND SPECIFICATIONS

Plans and specifications for installing structures for water control shall be in keeping with this standard and shall prescribe the requirements for applying the practice to achieve its intended purpose.

Plans and specifications for this practice shall be prepared for each site. Plans and specifications shall be recorded using approved specification sheets, job sheets, technical notes, narrative documentation in the conservation plan, or other acceptable documentation. Specifications shall be reviewed and approved by a person with appropriate training in the design and implementation of shallow water areas to benefit fish and wildlife.

The planner should work closely with the NRCS biologist, area engineer, or other wetland specialists in developing site-specific plans and specifications.

OPERATION AND MAINTENANCE

The impoundment (moist soil area) should be disked or burned during the summer drawdown period at three- to five-year intervals or when more than one-half the area is covered with undesirable plants. Common undesirable plants in Tennessee include black willow (Salix nigra), annual sumpweed (Iva annua), common cocklebur (Xanthium strumarium), cattails (Typha spp.), American lotus (Nelumbo lutea), and reed canarygrass (Phalaris arundinacea). These plants may aggressively dominate sites, while providing little food value for wildlife. Favor disking to control these plants and encourage more annuals, which may increase the production of more seeds for waterfowl consumption. Cocklebur should be disked before seed set and will need additional treatments for control. Disking cocklebur encourages seed germination.

Avoid annual disturbance that may encourage aggressive plants while reducing beneficial plants. Avoid extended years of no disturbance, which may allow dominance of undesirable plants.

Planned maintenance, which may include the control of undesirable vegetation through disturbance practices such as disking, shredding, approved herbicide application, and/or prescribed burning, should be provided in terms of methods, frequency, timing, and duration of treatments.

Consider the effects of residual herbicides.

A list of possible treatments for the control of select undesirable vegetation is provided below as a guide. Selected maintenance strategies shall be provided when needed.

Weed	Possible Treatment
Cattails	Mow late summer and flood deep over winter, or treat with an approved herbicide.
Willows	Mow or cut in summer. Treat regrowth or stumps with approved herbicide.
Cocklebur	Disk in summer. Shallow flood afterward or apply herbicide when >50 percent of the area is infested.

The following actions shall be performed to ensure this practice functions as intended throughout its expected life. These actions include normal repetitive

activities in the application and use of the practice (operation) and repair and upkeep of the practice (maintenance).

Any use of fertilizers, mechanical treatments, prescribed burning, pesticides, and other chemicals to assure the shallow water or moist soil area function shall not compromise the intended purpose. Pesticides shall be applied in accordance with label requirements.

Biological control of undesirable plant species and pests (e.g., using predator or parasitic species) shall be implemented, where available and feasible.

All structure sites shall have an adequate permanent protective cover maintained for the life of the practice. Whenever possible, select plant species that will both protect the structure and provide additional wildlife benefits (e.g., switchgrass, bluestems, Indiangrass, Virginia wildrye, various sedges, redtop, deertongue panicum). Damaged vegetative cover shall be re-established as early as possible in the next applicable planting season.

Operation and maintenance shall include monitoring and management of the site as well as structural components.

REFERENCES

Bailey, M. A. Small Isolated Wetlands: Vital to Diversity. 1999. Alabama Wildlife Magazine. 3 pp.

Eldridge. J. 1992. Management of Habitat for Breeding and Migrating Shorebirds in the Midwest. Fish and Wildlife Leaflet 13.2.14. Waterfowl Management Handbook. U.S. Fish and Wildlife Service. Washington, D.C. 6 pp.

Fredrickson, L. H. 1991. Strategies for Water Level Manipulations in Moist-Soil Systems. Fish and Wildlife Leaflet 13.4.6. Waterfowl Management Handbook. U.S. Fish and Wildlife Service. Washington, D.C. 8 pp.

Fredrickson, L. and F. A. Reid. 1988. Nutritional Values of Waterfowl Foods. Fish and Wildlife Leaflet 13.1.1. Waterfowl Management Handbook. U.S. Fish and Wildlife Service, Washington, D.C. 6 pp.

Fredrickson, L. H. and T. S. Taylor. 1982. Management of Seasonally Flooded Impoundments for Wildlife. U.S. Fish and Wildlife Service. Department of the Interior. Resource Publication 148. Washington, D.C. 29 pp.

Hammer, D. A. 1992. Creating Freshwater Wetlands. Lewis Publishers, Inc. Chelsea, Michigan. 298 pp.

Helmers, D. 1992. Shorebird Management Manual. Western Hemisphere Shorebird Reserve Network, Manomet, MA. 58 pp.

Kingsbury, B. and J. Gibson. 2002. Habitat Management Guidelines for Amphibians and Reptiles of the Midwest. Partners in Amphibian and Reptile Conservation, Ft. Wayne, IN. 57 pp.

Loesch, C. R., D. J. Twedt, K. Tripp, W. C. Hunter, and M. S. Woodrey. Development of Management Objectives for Waterfowl and Shorebirds in the Mississippi Alluvial Valley. Cornell Lab of Ornithology. Cornell University. Ithica, New York. 9 pp.

Minser, W. G., T. Pruitt, D. A. Buehler, C. A. Harper, and E. Z. Harsson. 2002.

Flooding harvested crop fields in winter: Effects on crop production and opportunities for waterfowl management. U.T. Extension, SP597. 4 pp.

Nassar, J. R., W. E. Cohen, and C. R. Hopkins. 1993. WATERFOWL HABITAT MANAGEMENT HANDBOOK FOR THE LOWER MISSISSIPPI RIVER VALLEY. 15 pp.

Ringleman. J. K. 1990. Managing Agricultural Foods for Waterfowl. Fish and Wildlife leaflet 13.4.3. Waterfowl Management Handbook. U.S. Fish and Wildlife Service. Washington, D.C. 4 pp.

Smith, L. M. and R. L. Pederson. 1989. Habitat management for migrating and wintering waterfowl in North America. Texas Tech University Press. 574 pp.

Somers, A. B., K. A. Bridle, D. W. Herman, A. B. Nelson. 2000. The Restoration & Management of Small Wetlands of the Mountains & Piedmont in the Southeast: A Manual Emphasizing Endangered & Threatened Species Habitat with a Focus on Bog Turtles. USDA Natural Resources Conservation Service, Watershed Science and Wetland Science Institutes. 152 pp.

Southeast Exotic Pest Plant Council. May, 2001. Report from the Tennessee Exotic Pest Plant Council. 6 pp.

USDA Natural Resources Conservation Service. 1975. Engineering Field Handbook, Chapter 6, Structures. Washington, D.C. 91 pp.

USDA Natural Resources Conservation Service. 1992. Engineering Field Handbook, Chapter 13, Wetland Restoration, Enhancement or Creation. Washington, D.C. 74 pp.

USDA Natural Resources Conservation Service Wetland Science Institute. 2000. Assessing Habitats Created by Installation of Drop Pipes. 8 pp.

USDA Natural Resources Conservation Service. Wildlife Habitat Management Institute. 2000. Shorebirds. Fish and Wildlife Habitat Management Leaflet number 17. 15 pp.